

Amendment to the claims under PCT Article 19

CLAIMS

1. (amended) A foreign language learning device comprising:  
word separation means (114) for receiving sentence speech  
5 information, the sentence speech information corresponding to speech  
produced successively by a learner when the learner utters a sentence  
including a plurality of words, to separate said sentence speech information  
into word speech information on the basis of each word included in said  
sentence;  
10 likelihood determination means (116) for evaluating degree of  
matching of each said word speech information with a model speech; and  
display output means (120) for displaying, for each said word, a  
resultant evaluation determined by said likelihood determination means.
- 15 2. (amended) The foreign language learning device according to  
claim 1, further comprising storage means (118) for storing a model  
sentence to be pronounced by said learner and model phoneme array  
information which corresponds to said model sentence and concerns the  
whole of said model sentence, wherein  
20 said display output means presents said model sentence to said  
learner in advance, and  
said word separation means includes  
phoneme recognition means for recognizing said sentence speech  
information on the basis of each phoneme information, and  
25 word speech recognition means for recognizing said word speech  
information for each said word according to said phoneme information and  
said model phoneme array information after the separation.
- 30 3. The foreign language learning device according to claim 2,  
wherein  
said phoneme recognition means includes phoneme likelihood  
determination means for determining likelihood of each phoneme  
information in said sentence speech information, with respect to each of

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phonemes that can be included in said foreign language, and

5 said likelihood determination means evaluates the degree of matching of each said word speech information by comparing, on a likelihood distribution plane of phoneme information in said sentence speech information, each word likelihood determined along a path followed when pronunciation follows a phoneme array exactly the same as said model phoneme array information with the sum of word likelihoods determined along mistakenly utterable candidate paths from a speech waveform of pronunciation by the learner.

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4. (amended) A foreign language learning method comprising the steps of:

15 receiving sentence speech information, the sentence speech information corresponding to speech produced successively by a learner when the learner utters a sentence including a plurality of words, and accordingly separating said sentence speech information into word speech information on the basis of each word included in said sentence (S106, S108);

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evaluating degree of matching of each said word speech information with a model speech (S110); and

displaying, for each said word, a resultant evaluation of each said word speech information (S110).

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5. (amended) The foreign language learning method according to claim 4, further comprising the step of presenting a model sentence to said learner in advance (S102), wherein

said step of separating said sentence speech information into said word speech information includes the steps of

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recognizing said sentence speech information on the basis of each phoneme information (S106), and

recognizing said word speech information for each said word according to model phoneme array information which corresponds to the model sentence presented to said learner and concerns the whole of said

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model sentence and according to said phoneme information after the separation (S108).

6. The foreign language learning method according to claim 5,  
5 wherein

10 said step of recognizing said sentence speech information on the basis of each phoneme information includes the step of determining likelihood of each phoneme information in said sentence speech information, with respect to each of phonemes that can be included in said foreign language, and

15 in said step of evaluating the degree of matching with the model speech, the degree of matching for each said word is evaluated by comparing, on a likelihood distribution plane of phoneme information in said sentence speech information, each word likelihood determined along a path followed when pronunciation follows a phoneme array exactly the same as said model phoneme array information with the sum of word likelihoods determined along mistakenly utterable candidate paths from a speech waveform of pronunciation by the learner.

20 7. The foreign language learning method according to claim 5, further comprising the step of evaluating a resultant pronunciation by said learner after practice of the pronunciation, said evaluation made on the basis of each said phoneme and said word in said model sentence uttered by said learner.

25 8. The foreign language learning method according to claim 7, wherein

30 said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying a vocal tract shape model for each said phoneme via a display unit to said learner.

9. The foreign language learning method according to claim 7, wherein

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5                    said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying, via a display unit to said learner, a model voice print and a voice print concerning pronunciation by said learner, said voice prints being compared with each other to be displayed.

10                10. The foreign language learning method according to claim 7, wherein

15                said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying, via a display unit to said learner, position of pronunciation by said learner on a formant plane.

20                11. A foreign language learning device comprising:

25                storage means (118) for storing a model sentence to be pronounced by a learner and model phoneme array information corresponding to said model sentence;

30                display output means (104, 120) for presenting said model sentence to said learner in advance;

35                word separation means (140.1) for receiving sentence speech information corresponding to a sentence pronounced by said learner to separate the sentence speech information into word speech information on the basis of each word included in said sentence;

40                likelihood determination means (140.4) for evaluating degree of matching of each said word speech information with a model speech; and

45                display output means (120) for displaying, for each phoneme and each said word, a resultant evaluation by said likelihood determination means,

50                said word separation means including phoneme recognition means for recognizing said sentence speech information on the basis of each phoneme information, and

55                word speech recognition means for recognizing said word speech information for each said word according to said phoneme information and said model phoneme array information after the separation, and

60                said foreign language learning device further comprising

pronunciation evaluation means for evaluating a resultant pronunciation after practice of the pronunciation for each said phoneme and for each said word in said model sentence uttered by said learner in a pronunciation practice period.

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12. The foreign language learning device according to claim 11, wherein

10 said pronunciation evaluation means displays a vocal tract shape model for each said phoneme via a display unit to said learner.

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13. The foreign language learning device according to claim 11, wherein

15 said pronunciation evaluation means displays, via a display unit to said learner, a model voice print and a voice print concerning pronunciation by said learner, said voice prints being compared with each other to be displayed.

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20 14. The foreign language learning device according to claim 11, wherein

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said pronunciation evaluation means displays, via a display unit to said learner, position of pronunciation by said learner on a formant plane.

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15. (amended) A computer-readable medium recorded thereon a program for executing a foreign language learning method by a computer, said foreign language learning method comprising the steps of:

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receiving sentence speech information, the sentence speech information corresponding to speech produced successively by a learner when the learner utters a sentence including a plurality of words, and accordingly separating said sentence speech information into word speech information on the basis of each word included in said sentence;

evaluating degree of matching of each said word speech information with a model speech; and

displaying, for each said word, a resultant evaluation of each said

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word speech information.

16. (amended) The computer-readable medium according to claim 15, wherein

5        said foreign language learning method further comprising the step of presenting a model sentence to said learner in advance, wherein  
          said step of separating said sentence speech information into said word speech information includes the steps of

10      recognizing said sentence speech information on the basis of each phoneme information, and

15      recognizing said word speech information for each said word according to a model phoneme array information which corresponds to the model sentence presented to said learner and concerns the whole of said model sentence and according to said phoneme information after the separation.

17. The computer-readable medium according to claim 16, wherein  
      said step of recognizing said sentence speech information on the basis of each phoneme information includes the step of determining  
20      likelihood of each phoneme information in said sentence speech information, with respect to each of phonemes that can be included in said foreign language, and

25      in said step of evaluating the degree of matching with the model speech, the degree of matching for each said word is evaluated by  
          comparing, on a likelihood distribution plane of phoneme information in said sentence speech information, each word likelihood determined along a path followed when pronunciation follows a phoneme array exactly the same as said model phoneme array information with the sum of word likelihoods determined along mistakenly utterable candidate paths from a  
30      speech waveform of pronunciation by the learner.

18. The computer-readable medium according to claim 16, wherein  
      said foreign language learning method further comprises the step of

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evaluating a resultant pronunciation by said learner after practice of the pronunciation, said evaluation made on the basis of each said phoneme and said word in said model sentence uttered by said learner.

- 5           19. The computer-readable medium according to claim 18, wherein  
          said step of evaluating a resultant pronunciation after practice  
thereof includes the step of displaying a vocal tract shape model for each  
said phoneme via a display unit to said learner.
- 10          20. The computer-readable medium according to claim 18, wherein  
          said step of evaluating a resultant pronunciation after practice  
thereof includes the step of displaying, via a display unit to said learner, a  
model voice print and a voice print concerning pronunciation by said  
learner, said voice prints being compared with each other to be displayed.
- 15          21. The computer-readable medium according to claim 18, wherein  
          said step of evaluating a resultant pronunciation after practice  
thereof includes the step of displaying, via a display unit to said learner,  
position of pronunciation by said learner on a formant plane.
- 20          22. (amended) A computer program for executing a foreign  
language learning method by a computer, said foreign language learning  
method comprising the steps of:  
          receiving sentence speech information, the sentence speech  
25        information corresponding to speech produced successively by a learner  
when the learner utters a sentence including a plurality of words, and  
accordingly separating said sentence speech information into word speech  
information on the basis of each word included in said sentence;  
          evaluating degree of matching of each said word speech information  
30        with a model speech; and  
          displaying, for each said word, a resultant evaluation of each said  
word speech information.